DINAMAP* *Compact* Monitor

Service Manual

Addendum

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Johnson & Johnson MEDICAL INC.
CRITIKON

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9. POWER SUPPLY SUPPLEMENT

9.1 INTRODUCTION

This service manual supplement provides service information about the updated battery charger circuit of the DINAMAP® *Compact* Vital Signs Monitor. It also provides information about changes to the remote alarm.

9.2 REMOTE ALARM

On Monitors with serial numbers 0018000 and subsequent, the remote alarm connector is removed and the remote alarm function is accessed via pin 8 of the host port connector.

9.3 UPDATED BATTERY CHARGER

On older Monitors that have been modified to include an updated battery charger, the power supplies are generated and controlled on power supply unit 8581, which includes power supply board 8620 and charger control PWA 315567. On newer Monitors, the power supplies are generated and controlled on power supply unit 8580.

The power supply is designed to operate from both an external DC line source and from a 12 volt rechargeable lead-acid battery. The supplied mains power converter provides 24 volt DC output. When both supplies are present, the power supply will operate from the line supply if it is greater than 12 volts. If the line supply is greater than 16 volts, the battery will be charged regardless of whether the monitor is switched on or off. The power supply sequencing functions are controlled by the PIC IC5.

Incoming line power from the external power converter has any high voltage spikes snubbed by transient suppresser D4, and over-voltage protection is provided by D6, R10 and thyristor CSR1. Excessive line voltage normally causes Zener diode D6 to conduct; in the event that the fuse for external power should fail to prevent a line input voltage rise above 34 volts, the instrument would be protected by the failure of CSR1. Reverse polarity protection for the power supply is provided by blocking diodes D8 and D29. A sample of the line input voltage is taken by R3 and R6 (DC_INPUT), and routed to the external DC detection circuit IC16 and the PIC.

The switcher IC3, inductor L1 and diode D10 form a back converter with a nominal output of 13.95 volts when the battery charge current is less than 75 mA. VRAW is nominally 13.7 volts under the same conditions and is supplied through the battery blocking diode D11.

With power supply board 8581, the control voltage for the main switcher IC3 is provided by a feedback network located at Node_F on the subassembly PWA. The subassembly PWA fitted to the PSU board enhances battery charger performance. Circuitry on this PWA controls the switching regulator IC3 on the PSU board to adjust the current and voltage applied to the battery during charging, and reduces power supplied to the battery when the monitor operation demands additional power. The maximum charge current is limited by U1 and Q2 to 1.8A when the monitor is switched off. When the monitor is switched on, the maximum battery charge current is reduced and is limited by R8 and Q2 on the sub-assembly.

With power supply board 8580, battery charger performance is enhanced by feedback circuitry controlling switching regulator IC3. The charging current and voltage applied to the battery are reduced whenever Monitor operation demands additional power. IC21 and TR16a limit the maximum charge current to 1.84 when the monitor is switched off. When the monitor is switched on, the maximum battery charge current is reduced and is limited by R126 and TR16b.

The PIC uses the DC_BATTERY, DC_INPUT and EXT_DC_ON signals to determine the available power sources. If valid power supply conditions exist and a battery is detected, the PIC will turn on TR7 which turns on the enhanced battery charger circuitry.

If there is no valid external DC line supply applied to the monitor, the monitor will default to use the battery. DC from the rechargeable battery arrives on thermal fuse FS1, from where it is routed to the source of TR2, a p-channel FET under the control of TR3. The battery supplies power to VRAW via transistor TR2 and diode D28. When operating from a battery, VRAW will be in the range 10.4 - 13.5 V depending on the battery charge. A sample of the battery's terminal voltage is taken by R1 & R2 and applied to the ADC input of the PIC (DC_BATTERY). From this, the PIC can determine the charge state of the battery.

Diodes D24 and D25 provide a power supply line VDC_OP which is present whenever a supply is available. This supply is used exclusively for IC16, a programmable voltage regulator with internal comparator. IC16 performs two functions. First, its internal comparator compares the sampled line input voltage DC_INPUT to an internal reference level. When the DC_INPUT is below approximately 10.4 volts, IC16 turns off TR14 to indicate to the PIC that there is no valid external DC input. The second function of IC16 is to generate a precision voltage supply from VDC_OP, set by R5 & R9 to 4.5 volts. This voltage is connected to the BATT_BACKUP line by D13, D23 preventing the voltage from entering the Nicad backup battery. This battery, B1, has a nominal terminal voltage of 3.6 volts and is trickle charged from the main switcher IC3 when the system is powered.

The VRAW supply, which is nominally 13.7 volts when the battery charge current is less than 75 mA and varies between 10 and 14.8 volts when charging the battery, is used to generate the other power supply lines. The monitor's power on switch is routed directly to the PIC which controls the set up sequencing of the power rails. The PIC switches on the +5VD line then the +VDISP line, the 12 volt supplies are controlled by the system processor which turns them on after the +5VD supply is stable.

VRAW enters IC7, a step down DC to DC converter which is used to produce the +5VD digital line. The 5 volt logic supply IC7 is controlled by the PSU_INH signal from the PIC. VRAW also connects to IC17 to produce the +4.5 volt LED display supply +VDISP, which is controlled by the PIC signal ENABLE_VDISP.

The 12 volt line and other supplies are controlled by the 12V_ON signal from the system processor on the Main Board. When this pin is at a high logic level, TR9 is turned on, as is p-channel FET TR10. This causes the VRAW supply to enter IC8, a boost switching regulator. R41 & R42 set the output voltage of the boost converter to 14.5 volts, which is further regulated by linear regulator IC9 to produce the pump and valve supply +12VV line and linear regulator IC18 to produce the analogue supply +12VR line. The output of TR10 also feeds the inverting switching regulator IC10, which produces a -14 volt supply to linear regulator IC19 which in turn produces the analogue supply -12VR line. A sample of the +12VV line is taken by R44 & R45, producing the PUMP_V signal, while a sample is taken across +12VR and -12VR lines by R47 & R48 producing the ANALOGUE_V signal. These are measured by ADCs inside the PIC to confirm the operation of the power supplies.

PSU Board 8580 Parts List

Item	Description	Part No.
B1	BATT, 3V6, 150mAh, NiMH, V150H	BAT-300010
C1,3,5,6,12, 23,25,26,31, 32,35,39,41, 42,46,47,53, 54,55,59,60, 61,63,67,70, 75	CAP, 0u1, 20%, 50V, MULTI CER, SMT, 0805 SIZE	CAP-238600
C2,8,24	CAP, 0u001, 5%, 50V, MULTI CER, SMT, 0805 SIZE	CAP-230080
C4	CAP, 100uF,63V, ELEC, RDL,2.54SP	CAP-116500
C7	CAP, 0u033, 10%, 50V, MULTI CER, SMT, 0805 SIZE	CAP-234050
C9	CAP, 2u2, 20%, 25V, TANT, SMT, CASE A	CAP-155600
C10,15,17,21,34,37,48	CAP,150uF,20V,ELEC,LO Z,5.0SP	CAP-113250
C11,30,36,52,66,73,74	CAP, 0u33, 10%, 25V, MULTI CER, SMT, 1206 SIZE	CAP-236000
C13	CAP, 33uF, 20%, 25V, ELECT, CASE D	CAP-101130
C14,16,18,22	CAP, 22pF, 5%, 50V, MULTI CER, SMT, 0603 SIZE	CAP-232000
C19	CAP, 100uF, 20%, 16V, ELECT, RADIAL, 2.5SP	CAP-119180
C20,57,65	CAP, 0u01, 10%, 50V, MULTI CER, SMT, 0805 SIZE	CAP-234010
C27,68	CAP, 330pF, 5%, 50V, MULTI CER, SMT, 0603 SIZE	CAP-230070
C28,69	CAP, 220uF, 20%, 10V, ELECT, LO Z, RADIAL, 5.0SP	CAP-113230
C29,43,44,49,50,51,71,76	CAP, 1u0, +80-20%, 16V, MULTI CER, SMT, 0805 SIZE	CAP-231010
C33	CAP, 470uF, 20%, 25V, ELECT, LO Z, RADIAL, 3.5SP	CAP-113220
C38	CAP, 4u7, 20%, 35V, TANT, SMT, CASE C	CAP-155570
C40	CAP, 330uF, 20%, 16V, ELECT, RADIAL, 3.5SP	CAP-119210
C45	CAP, 1.0uF, 25V, X7R, CER,1812	605-248
C58	CAP, 4u7, 20%, 16V, TANT, SMT, CASE B	CAP-155580
C62,72	CAP, 10uF, 20%, 16V, TANT, SMT	CAP-155620
C64	CAP, 220uF, 20%, 25V, ELECT, LO Z, RADIAL, 3.5SP	CAP-113200
CSR1	TICP106M RECTR, SILICON CONT, 2A, 600V, TO92	SCD-150010
D1,9,31	BAV70LT1 DIODE, DUAL, SOT23	610-143
D2,3,7,24,25,27,29	LL4148 DIODE, SILICON, SMALL SIGNAL, SMT	SCD-106010
D4,19	SM4T36C DIODE, SUPPRESSOR, TRANSIENT VOLT, SOD6	SCD-104530
D5	MMSZ5234B ZNR,6V2,500mW,SOD123	SCD-110020
D6	BZX84C33 DIODE, ZENER, 33V, 350mW, SOT23	SCD-108760
D8	D2F20 DIODE, RECTR, 1.4A, 200V, SMT, 57.6 x 4.0	SCD-100130
	NSD03A20 DIODE, RECTR, 3A, 200V, SMT, 8.0 x 4.0	or SCD-100140
D10	DE3L20U DIODE, FAST RECVRY, 3A, 200V, E PACK	SCD-100100
	30VF20F DIODE, FAST RECVRY, 4.7A, 200V, TO252	or SCD-100090
D11,18,28	SS34 DIODE, SILICON, SCHOTTKY, 3A, 40V, DO214	SCD-104080
D12	D1F20 DIODE, RECTR, 1A, 200V, SMT, 5.0 x 2.5	SCD-100120
	EC10DS2 DIODE, RECTR, 1A, 200V, SMT, 5.0 x 2.5	or SCD-100110

PSU Board 8580 Parts List (Continued)

Item	Description	Part No.
D13,23	LLBAT43 DDE, SCTKY, SMT, MNMLF	SCD-104060
D14	MMSZ5232B ZNR,5V6,500mW,SOD123	SCD-110010
D16,17,26	1N5817M DIODE, SCHOTTKY, 1A, 14V, MELF, 5.0 x 2.4	SCD-104040
D20,22	BZX84C5V1 DIODE, ZENER, 5.1V, 350mW, SOT23	SCD-108740
D21	1N5819M DIODE, SCHOTTKY, 1A, 28V, MELF, 5.0 x 2.4	SCD-104050
FB1	CHOKE, WIDE BAND, J8FE-1204-NC	IND-200030
	CHOKE, WIDE BAND, 2.5t, J8FE-1153-NC	or IND-200020
FS1	FUSE, 2.5A, RESETTABLE, PTC RES, SMT, 9.5 x 6.7	FSE-200010
FS2	FUSE, 100mA, RESETTABLE, PTC RES, 5.1SP	FSE-200000
IC1	SKT, IC, 20 WAY, PLCC, SMT	CON-200090
IC2	MAX809TCUR SUPERVISORY, MICROPROCESSOR, SOT23	ICS-800100
IC3	HEATSTRAP	DWG-1007
IC3	L4960H VOLT REG, ADJ, +5V/40V, 2.5A, HEPTAWATT	ICS-200480
IC3	SCREW, M3 x 8mm, PAN, SDRV, STL, ZnPL	SCR-302108
IC3,IC8.IC9	NUT, M3, FULL, STL, Zn PL	FIX-300000
IC3,IC8.IC9	WASHER, M3, PLN , STL, Zn PL	FIX-303000
IC4	LM392M OPAMP, FET, SNGL, DUAL, SUPP, DUAL, SO8	ICS-300450
IC5	SKT, IC, 44 WAY, PLCC, SMT	CON-440000
IC6	LM358D OPAMP, HI GAIN, DUAL, SO8	ICS-300460
IC7	MAX744ACWE VOLT CONV, +6V/16V TO 5V, 2A, SO16W	ICS-210010
IC8	LM2577T-ADJ VOLT REG, ADJ, +11.6/12.4V, 3A, TO226	ICS-200460
IC8.IC9	SCREW, M3 x 6mm, PAN, SDRV, STL, ZnPL	SCR-302106
IC9	LT1086-12CT VOLT REG, +12V, 1.5A, TO220	ICS-200080
IC10	MAX774CSA DC-DC CONT, INV, -5V/ADJ, 1A, SO8	ICS-210020
IC11	BU4S71 OR GATE, SNGL, SO5	ICS-140000
IC12	74HC00D NAND GATE, 2 INPUT POS, QUAD, SO14	ICS-740270
IC13	MAX232ACWE TxRx, DUAL, RS232, +5V, PWRD, SO16W	ICS-800260
IC14	4066BM SWITCH, ANALOG, BILATERAL, QUAD, SO14	ICS-400090
IC15	LM386M-1 POWER AMP, AUDIO, 325mW, SO8	ICS-300470
IC16	MAX666CSA VOLT REG, DUAL MODE, +5V, PROG, SO8	ICS-200090
IC17	MAX758ACWE VOLT REG,ADJ,CURR MDE,750mA,SO16W	ICS-200540
	MAX758ACPA VOLT REG, ADJ, CURRENT MDE, 750mA, DP8	or ICS-200530
IC18	78L12ACM VOLT REG, +12V, 100mA, SO8	ICS-200070
IC19	79L12ACD VOLT REG, -12V, 100mA, SO8	ICS-200250
IC20	LM324 OPAMP, QUAD, SO14	691-118
IC21	LM339AM COMPARATOR, QUAD, SO14	ICS-300190
IC22	TL431 PROG. PREC REF, SO8	693-102
IC23	MAX471CSA CURRENT SNSE AMP,SO8	691-132
L1	CHOKE, 120uH, 1.7A, 0.095 OHM, 16L x 7.0DIA, AXIAL	IND-200010
L2	INDUCTOR, 100uH, 1.2A, 0.22 OHM, 10.0 DIA, 5.0SP	IND-101010
L4,5,7	INDUCTOR, 47uH, 1.6A, 0.1 OHM, 10.0 DIA, 5.0SP	IND-101000
PL20	HDR, 2 WAY, RT ANGL, LOCK, 'MOLEX', 2.54SP	CON-021070
PL22,27	HDR, 2 x 8 WAY, RT ANGL, SHROUDED, 'MOLEX', 2.54SP	CON-160130
PL23	HDR, 2 x 3 WAY, STRT, 'HIROSE', SMT, 2.0SP	CON-060170
PL24	HDR, 4 WAY, RT ANGL, LOCK, 'MOLEX', 3.96SP	CON-040180

PSU Board 8580 Parts List (Continued)

Item	Description	Part No.
R1,14	RES, 51k, 1%, 1/10W, SMT, 0805 SIZE	RES-475430
R2,4,15,28, 30,34,39,45, 46,47,67,122	RES, 100k, 1%, 1/10W, SMT, 0805 SIZE	RES-475770
R3	RES, 1k3, 1%, 1/10W, SMT, 0805 SIZE	RES-473610
R5	RES, 2M00, 2%, 1/10W, SMT, 0805 SIZE	RES-477230
R6,102	RES, 9k1, 1%, 1/10W, SMT, 0805 SIZE	RES-474590
R7,8,13,23, 25,26,56,59, 73,74,80,81, 84,85,86,87, 107,121,125	RES, 20k0, 1%, 1/10W, SMT, 0805 SIZE	RES-474950
R9	RES, 820k, 1%, 1/10W, SMT, 0805 SIZE	RES-476810
R10,42	RES, 1k2, 1%, 1/10W, SMT, 0805 SIZE	RES-473570
R11,12,27,33,37,61,71,119,130,132	RES, 10k0, 1%, 1/10W, SMT, 0805 SIZE	RES-474630
R16,57,60,65,88,89,90,91, 92,93,94, 95, 96,97,98, 99,100	RES, 1k00, 1%, 1/10W, SMT, 0805 SIZE	RES-473490
R17,36,101, 104,105,118	RES, 200k, 1%, 1/10W, SMT, 0805 SIZE	RES-476090
R18	RES, 15k0, 1%, 1/10W, SMT, 0805 SIZE	RES-474810
R19	RES, 4k30, 1%, 1/10W, SMT, 0805 SIZE	RES-474200
R20	RES, 68k, 1%, 1/10W, SMT, 0805 SIZE	RES-475580
R21,50	RES, 82k, 1%, 1/10W, SMT, 0805 SIZE	RES-475670
R22	RES, 18k, 1%, 1/10W, SMT, 0805 SIZE	RES-474900
R24,29	RES, 10M0, 5%, 1/10W, SMT, 0805 SIZE	RES-478040
R31	RES, 0R1, 5%, 2.5W, W/W, CEMENTED, AXIAL	RES-560030
R32	RES, 30k, 1%, 1/10W, SMT, 0805 SIZE	RES-475150
R35,106,117	RES, 5k1, 1%, 1/10W, 0805	RES-474290
R38	RES, 4k7, 1%, 1/10W, SMT, 0805 SIZE	RES-474250
R40	RES, 2k00, 1%, 1/10W, SMT, 0805 SIZE	RES-473810
R41	RES, 13k0, 1%, 1/10W, SMT, 0805 SIZE	RES-474750
R43,111	RES, 62k, 1%, 1/10W, 0805	RES-475540
R44,52,66, 116	RES, 24k, 1%, 1/10W, SMT, 0805 SIZE	RES-475040
R48,78	RES, 150k, 1%, 1/10W, SMT, 0805 SIZE	RES-475950
R49,109	RES, 510R, 1%, 1/10W, SMT, 0805 SIZE	RES-473150
R51,55	RES, 47k, 1%, 1/10W, SMT, 0805 SIZE	RES-475390
R53	RES, 12k, 1%, 1/10W, SMT, 0805 SIZE	RES-474710
R54,62,63, 76,77	RES, 1R0, 1%, 1/10W, SMT, 0805 SIZE	RES-470070
R58	RES, 3k3, 1%, 1/10W, SMT, 0805 SIZE	RES-474060
R64	RES, 2R7, 1%, 1/10W, SMT, 0805 SIZE	RES-470540

PSU Board 8580 Parts List (Continued)

Item	Description	Part No.
R68	RES, 2k2, 1%, 1/10W, SMT, 0805 SIZE	RES-473850
R69,72	RES, 510k, 1%, 1/10W, SMT, 0805 SIZE	RES-476570
R70	RES, 27k, 1%, 1/10W, SMT, 0805 SIZE	RES-475100
R75	RES, 10R, 1%, 1/10W, SMT, 0805 SIZE	RES-471210
R79	RES, 1M43, 1%, 1/10W, SMT, 0805 SIZE	RES-477070
R108	RES, 100R, 1%, 1/10W, 0805	RES-472350
R110,112	RES, 3k0, 1%, 1/10W, 0805	RES-474010
R113,124, 128,129	RES, 1M0, 1%, 1/10W, 0805	RES-476910
R115,131	RES, 33k, 1%, 1/10W, 0805	RES-475200
R120	RES, 5k6, 1%, 1/10W, 0805	RES-474340
R123,127,133	RES, 7k50, 1%, 1/10W, 0805	RES-474490
R126	RES, 3R3, 5%, 3W, W/W, VIT, AXL	RES-555010
RV1	POT, 10k, 1/8W,1t, SMT	630-304
SK21	SKT, 2 x 20 WAY, PCB, 2.54SP	CON-400130
SK28	SKT, 2 WAY, STRT, PCB, 2.54SP	CON-021090
TR1,4	Si9955DY NMOS, ENHANCEMENT MODE, DUAL, SO8	SCD-700110
TR2,10,12	ME4P06F PMOS, TO252	SCD-750030
TR3,9	IMH3A NPN, BASE RES, DUAL, SO6	SCD-200070
TR6,14	MMBT2222A NPN, SOT23	SCD-200090
TR8	Si9410DY NMOS, ENHANCEMENT MODE, SO8	SCD-700100
TR11	2N7002 NMOS, ENHANCEMENT MODE, SOT23	SCD-700060
TR13	BC857C PNP, SOT23	SCD-200100
TR16	Si4953DY PMOS, DUAL, SO8	SCD-676172
XL1	CRYSTAL, 4MHz, HC49, SMT, SHORT	XTL-100090
XL2	CRYSTAL, 32.768kHz, 4 PIN, SMT, 9 x 3	XTL-100080
#251	TAPE, SILN, 19W, KAPTON K6338	LAB-300010

PSU Assembly 8581 Parts List

Item	Description	Part No.
IC3	SCREW, M3 x 8mm, PAN, SDRV, STL, ZnPL	SCR-302108
#2	HEATSINK, STRAP	DWG-1007
#3	ASSEMBLY, PSU BOARD	DWG-8620
#5	ASSEMBLY, COMPACT, CHARGER CONTROL	AS-315567
#8	CAP, 0u1, 20%, 50V, MULTICER, SMT, 0805 SIZE	CAP-238600
#21	WIRE, 20AWG, 0.91mm, BTC	CBL-110140
#22	WIRE, 30AWG(0,25mm)TEFLON, GREEN, WIRE-WRAP	CBL-130050
#23	SLEEVING, 1.9mm, PTFE, NAT	CBL-630000

Charger Control PWA 315567 Parts List

Item	Description	Part No.
C1, 4	Cap, 0.1u, cer, 0805	603-641
C3, 7	Cap, 1.0u, 25v, cer, smt, 1812	605-248
C6	cap, 4.7u, tantilum	606-106
CR1	Diode, Schottkey, 3A, MBRS340T3	611-145 or 610-148
CR3, 4, 5	diode, dual,BAV70LT1	610-143
Q2	FET, P-mos, dual	676-172
Q5	Transistor, mmbt2222a	674-127
R1, 2, 5	res, 7.5k, 0603	686-377
R4, 21, 32	res, 20.0k, 0603	686-418
R7, 31, 39, 40	res, 1.0meg, 0603	686-581
R8	RES, 3R3, 5%, 3W, W/W VIT AXL	655-137
R9, 11, 26, 43	res, 10.0k, 0603	686-389
R10, 23	RES,0603,1/16W,1%,33K OHM	686-614
R12, 28, 29, 30, 41	res, 200k, 0603	686-514
R13, 18	RES,0603,1/16W,1%,62K OHM	686-616
R14, 34, 42	res, 100k, 0603	686-485
R16	RES,0603,1/16W,1%,510 OHM	686-610
R17, 19	RES,0603,1/16W,1%,3.00K OHM	686-615
R20, 25	RES,0603,1/16W,1%,5.10K OHM	686-611
R22	res, 100 ohm, 0603	686-197
R27	RES,0603,1/16W,1%,5.60K OHM	686-612
R33	Pot, 10k, 1 turn, smt	630-304
R37	RES,0603,1/16W,1%,24K OHM	686-613
R38	res, 10M, 0603	686-605
U1	LM339, Quad Comparator	693-125
U2	LM 324, Quad Opamp	691-118
U3	Max 471	691-132
U4	TL431, voltage Ref	693-102

(Include the following drawings here at the end)

AS315567 (3 shts)
SC315567 (1 shts)
8580AB00 (1 shts)
8580CB00 (6 shts)
8581AB01 (1 shts)
8581CB01 (6 shts)